

DESIGN SPEED

The minimum design speed for bike paths is 25 miles per hour. On sections where there are long downgrades (steeper than 4%, and longer than 500 feet), the design speed is 31 miles per hour. Speed bumps or other surface irregularities should never be used to slow bicycles.

HORIZONTAL ALIGNMENT

Recommended curve radii and superelevations (banking) can be calculated per equation 1003.1C in Chapter 1000 of the Caltrans Highway Design Manual. A 2% cross slope is recommended for drainage, and should generally not be exceeded. The off-street portions of the SR-89 Bikeway should have only gradual curves, and sharp curves are generally not anticipated along the trail, except at trail entrance/exit points and at transitions at the north and south ends of the corridor.

LATERAL CLEARANCE ON HORIZONTAL CURVES

Stopping sight distance, stopping sight distance on horizontal curves, and lateral clearance can be calculated using equations 1003.1D, E, and F in Chapter 1000 of the Highway Design Manual. Due to the topography and forested vegetation along the SR-89 corridor, the final trail alignment should ensure adequate sight distances on curving sections of trail. This is especially important in areas where the trail will cross roadways (e.g. the Ring Roads), or will transition onto a Class III route as proposed in the Off-Highway Bikeway option.

GRADIENTS

Steep grades should be avoided on any multi-use trail, with 5% the recommended maximum gradient. Steeper grades can be tolerated for short distances (up to about 500 feet). Gradients greater than 5% may be unavoidable along some portions of the proposed Off-Highway bikeway alignment. In these situations, the design speed should be increased and additional width should be provided. In these cases, the Hill (W7-5) sign may be installed to warn bicyclists of conditions ahead. To reduce the number of signs, a pavement marking stating “Slow Steep Grade” could be placed prior to the hill. Such signage could be installed, for example, on the Off-Highway Bikeway segment utilizing the D.L. Bliss State Park entrance road.



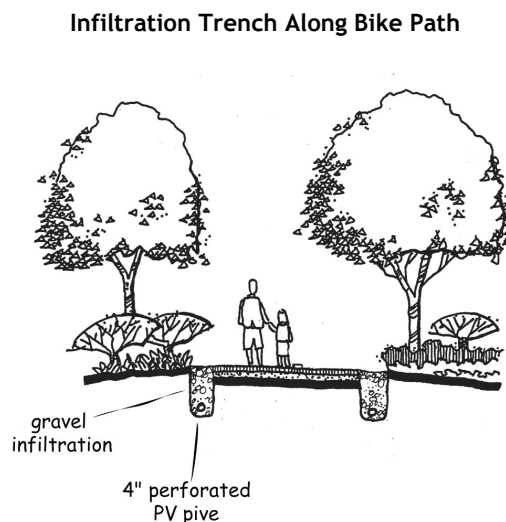
Sample Signage Indicating Steep Grade Ahead

STRUCTURAL SECTION

Bike path construction should be conducted in a similar manner as roadway construction, with sub-base thickness to be determined by soils condition and expansive soil types requiring special structural sections. Minimum asphalt thickness should be 3 inches of Type A or Type B as described by Caltrans Standard Specifications, with 3 inch maximum aggregate and medium grading. The preferred pathway material for the SR-89 Bikeway is a 4-inch asphalt concrete material with sub-base or 6 inches of reinforced concrete on compacted native material (if suitable).

DRAINAGE

The 2% cross slope will resolve most drainage issues on a bike path, except along cut sections where uphill water must be collected in a ditch and directed to a catch basin, where the water can be directed under the trail in a drainage pipe of suitable dimensions. Caltrans is required to comply with stormwater discharge requirements for the Lake Tahoe Basin that are specified in the Caltrans Statewide Permit, Tahoe Basin construction permits, and the Lahontan RWQCB Basin Plan. In some cases, the requirements may be met by allowing unconcentrated runoff from bike paths to sheet flow to infiltrate in the unpaved shoulders or adjacent vegetated areas. In other areas, particularly where water is collected in a ditch or the bike path is adjacent to SR-89, additional measures may be needed to treat stormwater runoff. Chapter 4 of the Basin Plan notes that specific stormwater runoff control measures can be found in a variety of BMP handbooks, including the “State of California Stormwater Best Management Practices Handbooks,” prepared by the American Public Works Association Storm Water Task Force, and the TRPA’s 1988 BMP Handbook.



BARRIER POSTS

Posts at trail intersections and entrances may be necessary to keep vehicles from entering. Posts should be designed to be visible to bicyclists and others, especially at nighttime, with reflective materials and appropriate striping. Posts should be designed to be moveable by emergency vehicles.

FENCING

Fences are the most common type of physical barrier used in trail corridors. A number of fencing types are available, ranging from simple low wood rail fences to tall, heavy-duty steel fences. Selection of a fencing type depends on the amount of trespassing anticipated along a given segment of the RWT, and the aesthetic qualities desired. Low wood split rail fences are currently used in the area and are recommended to separate path users from adjacent property.

SIGNING AND MARKING

Off-highway portions of the SR-89 Bikeway should be designed to include all of the required and recommended signing and marking standards developed by Caltrans in Chapter 1000 of the Highway Design Manual. In addition, all signs and markings should conform to the standards developed in the Manual of Uniform Traffic Control Devices (MUTCD).

In general, all signs should be located three to four feet from the edge of the paved surface, have a minimum vertical clearance of 8.5 feet when located above the trail surface and be a minimum of

four feet above the trail surface when located on the side of the trail. All signs should be oriented so as not to confuse motorists. The designs (though not the size) of signs and markings should be the same as used for motor vehicles.

ENTRANCE FEATURES

Major entrances to the bikeway may contain a variety of support facilities and other items, depending on available resources and local support. Typical entrance features would include:

- **Trailheads.** The trail will draw substantial numbers of users during peak times. Trail users could be directed to specific trailheads where parking and other amenities are provided, helping to relieve some of the pressure on residential and commercial areas. Trailheads may also contain drinking fountains, telephones, restrooms, bike lockers, and other features. Trailheads should be accessible by transit service.
- **Bollards.** A single 48-inch wood or metal bollard (post) should be placed on the centerline of the trail at all entrances to prevent motor vehicles from entering the trail. The bollard should be designed with high reflective surfaces and be brightly painted. The bollard should be locked to a ground plate and be easily removed by emergency vehicles.
- **Other Entrance Features.** The trail alignment should have a sharp (20 foot or less radius) curve at all major roadway intersections wherever physically possible, to help slow bicycles. Entrance circles may be constructed with a 20-foot inside radius to help slow bicycles. Entrance signs may be placed in the circle. Entrance signs should include regulations, hours of operation (if any), and trail speed limit. Entrance signs may also include sponsorships by local agencies, organizations, and/or corporations. Signs may be placed at the entrances or at appropriate locations along the trail that provide brief descriptions of historic events or natural features.

RETAINING WALLS

Retaining walls will be necessary along some portions of the proposed trail where grading is required to construct a level path. A three-foot graded area between the wall and pathway is desirable to provide clearance and increase the comfort level of bicyclists and pedestrians using the pathway. In some areas of the corridor, such as the steeply slope section between the Emerald Bay Service Road and the D.L. Bliss State Park entrance, it may be necessary to construct a retaining wall or raised bridge type structure in order for the trail to follow the highway. These concepts are illustrated in **Figures 5-3, 5-4 and 5-5.**